

Claims

1. A MEMS device including a rotor including an aperture, a shaft extending through the aperture, and a stator attached to the shaft, the device including one of more grooves located to form at least one air bearing  
5 between the rotor and at least one of the stator and the shaft upon rotation of the rotor around the shaft.
- 2 A device according to claim 1 in which at least some of the grooves are formed on the rotor surrounding the aperture, to generate a positive pressure between the rotor and the stator to urge the rotor and the stator apart.
- 10 3. A device according to claim 1 or claim 2 in which the grooves generate an air flow in the gap between the rotor and the shaft, an air bearing being formed in this gap.
4. A device according to claim 3 in which the gap between the rotor and the shaft includes at least three circumferentially spaced constrictions,  
15 whereby air bearings are generated at the constrictions upon rotation of the rotor and urge a central axis of the rotor towards a rotational axis of the shaft.
5. A device according to claim 3 or claim 4 in which the shaft includes a frustoconical section opposing a frustoconical surface of the rotor, an air bearing being formed between the surfaces upon rotation of the rotor.
- 20 6. A device according to claim 5 in which the frustoconical surface of the shaft is formed on a wide portion of the shaft located within a chamber included in the substrate.
7. A device according to claim 6 in which the rotor includes two joined substrates defining the chamber between them.

8. A device according to claim 7 in which the two substrates are joined sandwiching a metal layer.
9. A device according to any preceding claim in which the rotor includes recesses facing the stator and including yoke material and magnetic material,  
5 the stator having a surface including conductive loops.
10. A method of producing a MEMS device, the method including forming a grooves in a rotor, attaching a stator to a shaft and positioning a rotor on the shaft, the grooves generating an air bearing upon rotation of the rotor around the shaft.
- 10 11. A method according to claim 10 further including forming the rotor by the steps of:
- forming one or more openings in each of two substrates,
- positioning one or more shafts each having a wide portion between the substrates in register with the respective openings, and
- 15 joining the two substrates with the openings in the respective substrates in register to form respective chambers entrapping the wide portions of the respective shafts.
12. A method according to claim 11 in which the openings in one of the substrates are formed with frustoconical walls, whereby the chambers include  
20 frustoconical walls, each shaft being provided with a frustoconical surface facing the frustoconical wall of the respective chamber.
13. A method according to any of claims 11 to 12 in which the two substrates are joined sandwiching a metal layer.

14. A method according to any of claims 10 to 13 further including forming recesses in the rotor and depositing yoke material and magnetic material into the recesses.
- 5 15. A device according to any of claims 1 to 9 which is used in a gyroscope, a HDD motor, a DVD motor, a zoom lens motor, a pump, or a fan.